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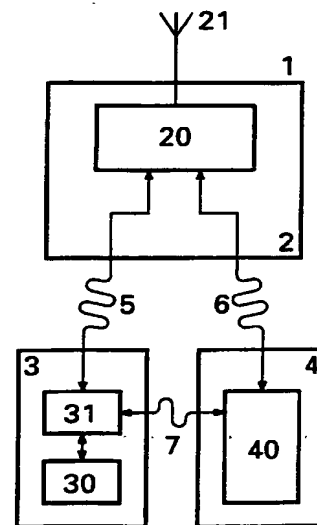
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(54) **Mobile device for, by way of a radio link, setting up a telecommunication connection**

(57) Although mobile handsets for providing a telecommunication function have been designed for a user to be capable of moving freely, in practice it turns out that particularly in objects the quality of the radio link is often poor, which in its turn restricts the mobility of the user to one location where said quality is reasonable. By mutually coupling the high-frequency part of the mobile handset, which comprises an antenna and a transceiver coupled to the antenna, and the low-frequency part, which comprises a loudspeaker, a microphone, a key pad and a display, which parts are detachably connected by way of a telecommunication coupling for the providing, both in connected mode and in detached mode, of the telecommunication function, the high-frequency part is capable of being placed at a location where the quality of the radio link is good, while the user can still move relatively freely holding the low-frequency part.



**Fig. 3**

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## Description

### A. BACKGROUND OF THE INVENTION

The invention relates to a mobile device for, by way of a radio link, setting up a telecommunication connection for, by way of an established telecommunication connection, providing at least one telecommunication function, which device is provided with a high-frequency part and with a low-frequency part, which parts are detachably connected.

Such a mobile device is disclosed, e.g., in US 4,718,110 and relates to, e.g., a so-called handset. Such a handset provides at least one telecommunication function, such as, e.g., speech communication or data transport, and is provided with a separate high-frequency part and with a separate low-frequency part, in order to prevent signals present in the high-frequency part from causing interferences in the low-frequency part. In this connection, the being detachably connected of the parts has the advantage that both parts are easily replaceable.

Said known mobile device has the drawback, inter alia, that although handsets have been designed for a user to be capable of moving freely, in practice it turns out that particularly in objects the quality of the radio link is often poor, which in its turn restricts the mobility of the user to one location where the quality of the radio link is reasonable.

### B. SUMMARY OF THE INVENTION

The object of the invention is, inter alia, to provide a mobile device of the type referred to in the preamble, with which the mobility of the user is still guaranteed.

For this purpose, the mobile device according to the invention is characterised in that the high-frequency part and the low-frequency part are mutually coupled by way of at least one telecommunication coupling for, both in connected mode and in detached mode, providing the at least one telecommunication function.

By mutually coupling the high-frequency part and the low-frequency part by way of at least one telecommunication coupling for, both in connected mode and in detached mode, providing the at least one telecommunication function, the high-frequency part may be placed at a location where the quality of the radio link is good, while the user can still move relatively freely holding the low-frequency part. A simple embodiment of the telecommunication coupling might be realised by applying electrical wires. A more sophisticated solution makes use, in a manner known to those skilled in the art, of, e.g., infrared techniques or of ultrasonic techniques or even of radio-frequency techniques.

The invention is based, inter alia, on the insight that, particularly in objects such as buildings or trains, the locations where the quality of the radio link is good, such as, e.g., windows, often do not coincide with a location where a user desires to move freely. In addition,

the invention is further based, inter alia, on the insight that a human user of a prior-art handset absorbs a significant portion of the power transmitted by the handset, which is not beneficial to the quality of the radio link. By possibly spatially separating the user and the high-frequency part from one another, said absorption of the transmitted power sharply decreases. This improves the quality of the radio link and reduces the energy consumption of the handset, and furthermore has the advantage that the user is much less exposed to the high-frequency radiation, which is beneficial to the user's health.

In this manner, the problem of the still poor mobility of a user of prior-art handsets is solved by a possible spatial separation of the high-frequency part and the low-frequency part, with the additional advantages that the quality of the radio link improves and the energy consumption decreases, and the user is less exposed to the high-frequency radiation.

A first embodiment of the mobile device is characterised in that the low-frequency part comprises a first subpart and a second subpart, which subparts are detachably connected and are mutually coupled by way of at least one further telecommunication coupling for, both in further connected mode and in further detached mode, providing the at least one telecommunication function.

By separating the low-frequency part into at least the first subpart and the second subpart, which subparts should be detachably connected and should be mutually coupled by way of at least one further telecommunication coupling for, both in further connected mode and in further detached mode, providing the at least one telecommunication function, it is achieved that different functionalities of the low-frequency part may be utilised from different locations, which sharply increases the user friendliness of the handset.

A second embodiment of the mobile device is characterised in that the high-frequency part is provided with an antenna and a transceiver coupled to the antenna, with the low-frequency part being provided with a loudspeaker, a microphone, a key pad and a display.

A third embodiment of the mobile device is characterised in that the first subpart is provided with the loudspeaker and the microphone, with the second subpart being provided with the key pad and the display.

A fourth embodiment of the mobile device is characterised in that the mobile device is provided with a power supply located in the high-frequency part.

By placing the power supply of the mobile device in the high-frequency part, said power supply is located there where the most power is required. By way of the telecommunication coupling and the further telecommunication coupling, power should then be fed to the low-frequency part.

A fifth embodiment of the mobile device is characterised in that the mobile device is provided with a power supply which is located in the second subpart.

By placing the power supply of the mobile device in

the second subpart, which power supply often substantially determines the weight of the handset, the power supply is located there where the significant weight is most beneficial to the user friendliness, while the high-frequency part and the first subpart may then be implemented lightweight. By way of the telecommunication coupling and the further telecommunication coupling, power should then be fed to the high-frequency part and the first subpart.

A sixth embodiment of the mobile device is characterised in that the at least one telecommunication coupling is dimensioned for the providing, by the mobile device, of the at least one telecommunication function at a minimum distance between the high-frequency part and the low-frequency part of 50 cm.

A seventh embodiment of the mobile device is characterised in that the at least one further telecommunication coupling is dimensioned for the providing, by the mobile device, of the at least one telecommunication function at a minimum distance between the first subpart and the second subpart of 50 cm.

In US 5,265,158 it is disclosed to fabricate a handset modularly, in US 5,426,689 it is disclosed to provide a cordless handset with a so-called headset (headphone-microphone), and in FR 2,709,389 there is disclosed a so-called handsfree telephone set. In none of the said documents it is disclosed to provide a mobile device with a high-frequency part and with a low-frequency part, which parts are detachably connected, with the high-frequency part and the low-frequency part being mutually coupled by way of at least one telecommunication coupling for, both in connected mode and in detached mode, providing at least one telecommunication function.

### C. REFERENCES

- [1] US 4,718,110
- [2] US 5,265,158
- [3] US 5,426,689
- [4] FR 2,709,389.

All references are considered as being incorporated in the present patent application.

### D. EXEMPLARY EMBODIMENT

The invention will be explained in greater detail by reference to an exemplary embodiment shown in the Figures. In this connection,

- FIG. 1 shows a mobile device according to the invention in connected mode;
- FIG. 2 shows a mobile device according to the invention in partly detached mode, and
- FIG. 3 shows a mobile device according to the invention in fully detached mode.

The mobile device shown in Figures 1, 2 and 3,

such as, e.g., a handset 1, comprises a high-frequency part 2 and a low-frequency part 3,4. Said low-frequency part comprises a first subpart 4 and a second subpart 3. The high-frequency part 2 is provided with a transceiver 20 and an antenna 21 coupled to transceiver 20. The first subpart 4 of the low-frequency part 3,4 is provided with a loudspeaker/microphone 40. The second subpart 3 of the low-frequency part 3,4 is provided with a key pad/display 30 and with a processor 31 coupled to key pad/display 30. Transceiver 20 is coupled, by way of a coupling 5, to processor 31 and is coupled, by way of a coupling 6, to loudspeaker/microphone 40. Processor 31 is coupled, by way of a coupling 7, to loudspeaker/microphone 40.

The operation of the handset 1 shown in FIG. 1 is as follows. In connected mode, such as shown in FIG. 1, the high-frequency part 2 and the low-frequency part 3,4 form one whole, which is kept together, e.g., by way of a snap-in system not shown in the Figures. Transceiver 20 receives signals by way of antenna 21 which have a carrier-wave frequency of, e.g., 900 MHz or 1800 MHz. After reception, transceiver 20 demodulates said signals, whereafter signalling parts and/or data parts are fed to processor 31 by way of coupling 5 and/or audio parts are fed to loudspeaker/microphone 40 by way of coupling 6. In response to the signalling parts and/or data parts, processor 31 feeds signals to key pad/display 30 for displaying certain information and/or processor 31 feeds signals to loudspeaker/microphone 40 by way of coupling 7 for (de)activating and/or setting the loudspeaker and/or the microphone. Information originating from key pad/display 30 is fed to processor 31 which, in response to said information, feeds signals to loudspeaker/microphone 40 by way of coupling 7 for (de)activating and/or setting the loudspeaker and/or the microphone, and/or which, in response to said information, feeds signalling signals and/or data signals to transceiver 20 by way of coupling 5. Audio signals originating from loudspeaker/microphone 40 are fed, by way of coupling 6, to transceiver 20 which, if necessary, combines and then modulates and subsequently transmits the signalling signals and/or data signals and/or audio signals by way of antenna 21.

The operation of the handset 1 shown in the Figures 2 and 3 is as described above, with the exception of the following. Both in partly detached mode, as shown in FIG. 2, and in fully detached mode, as shown in FIG. 3, the high-frequency part 2 and the low-frequency part 3,4 no longer form one whole, but are spatially separated, while they are still mutually coupled by way of at least one telecommunication coupling, namely, coupling 5 and coupling 6. According to a simple embodiment, both couplings are ordinary electrical wires and, according to a more sophisticated embodiment are based on, e.g., infrared techniques or ultrasonic techniques or radio-frequency techniques. In the event of couplings based on infrared techniques, both the high-frequency part 2 and the low-frequency part 3,4 should each be provided with an infrared transmitter

not shown in the Figures and an infrared receiver not shown in the Figures. In the event of couplings based on ultrasonic techniques, both the high-frequency part 2 and the low-frequency part 3,4 should each be provided with an ultrasonic transmitter not shown in the Figures and an ultrasonic receiver not shown in the Figures. In the event of couplings based on radio-frequency techniques, both the high-frequency part 2 and the low-frequency part 3,4 should each be provided with a radio-frequency transmitter not shown in the Figures and a radio-frequency receiver not shown in the Figures.

The operation of the handset 1 shown in FIG. 3 is as described above, with the exception of the following. While in partly detached mode of handset 1, as shown in FIG. 2, the low-frequency part 3,4 forms one whole, the low-frequency part 3,4 in fully detached mode of handset 1, as shown in FIG. 3, consists of the first subpart 4 and the second subpart 3, which two subparts are spatially separated while they are still mutually coupled by way of at least one further telecommunication coupling, namely, either coupling 5 and coupling 6 or coupling 7. Just as couplings 5 and 6, coupling 7 according to a simple embodiment comprises one or more ordinary electrical wires, and coupling 7 according to a more sophisticated embodiment is based on, e.g., infrared techniques or ultrasonic techniques or radio-frequency techniques, with once again both the first subpart 4 and the second subpart 3 each having to be provided with a transmitter and a receiver.

Although the invention relates to a mobile device for setting up, by way of a radio link, a telecommunication connection for the benefit of at least one telecommunication function, which device is provided with a high-frequency part and with a low-frequency part which are detachably connected and which are mutually coupled by way of at least one telecommunication coupling for, both in connected mode and in detached mode, providing the at least one telecommunication function, the invention does not preclude that in practice different low-frequency parts are each capable of being coupled, by way of an own telecommunication coupling, to one and the same high-frequency part.

Of course, handset 1 disposes of a power supply not shown in the Figures. If said power supply, such as, e.g., a rechargeable battery, is placed in the high-frequency part 2, this has the advantage that said power supply is located there where the most power is required. By way of the couplings 5 and/or 6, power could then be fed to the low-frequency part 3,4. If said couplings 5 and/or 6 comprise electrical wires, the power is transmitted by way of, e.g., DC signals, while signalling signals and/or data signals and/or audio signals are transmitted by way of, e.g., AC signals or by way of modulation/ demodulation techniques. In the event of application of modulation/ demodulation techniques, there are of course required modulators and demodulators. Also, the low-frequency part 3,4 could be provided with at least one separate power supply (possibly per subpart), in which case no power need be fed

from the high-frequency part 2 to the low-frequency part 3,4. Particularly in the event of couplings based on infrared techniques or ultrasonic techniques or radio-frequency techniques, transmitting power is very disadvantageous and very undesirable. If the power supply is placed in the second subpart 3, which power supply often substantially determines the weight of the handset, the power supply is located there where the significant weight is most beneficial to the user friendliness, while the high-frequency part 2 and the first subpart 4 may then be constructed lightweight. By way of the couplings 5 and/or 6 and/or 7, there could then be fed power to the high-frequency part 2 and to the first subpart 4, with the advantages and drawbacks and options discussed above for couplings implemented as wires and for cordlessly implemented couplings again being applicable.

#### Claims

1. Mobile device for, by way of a radio link, setting up a telecommunication connection for, by way of an established telecommunication connection, providing at least one telecommunication function, which device is provided with a high-frequency part and with a low-frequency part, which parts are detachably connected, characterized in that the high-frequency part and the low-frequency part are mutually coupled by way of at least one telecommunication coupling for, both in connected mode and in detached mode, providing the at least one telecommunication function.
2. Mobile device according to claim 1, characterised in that the low-frequency part comprises a first subpart and a second subpart, which subparts are detachably connected and are mutually coupled by way of at least one further telecommunication coupling for, both in further connected mode and in further detached mode, providing the at least one telecommunication function.
3. Mobile device according to claim 2, characterised in that the high-frequency part is provided with an antenna and a transceiver coupled to the antenna, with the low-frequency part being provided with a loudspeaker, a microphone, a key pad and a display.
4. Mobile device according to claim 3, characterised in that the first subpart is provided with the loudspeaker and the microphone, with the second subpart being provided with the key pad and the display.
5. Mobile device according to claim 4, characterised in that the mobile device is provided with a power supply located in the high-frequency part.

6. Mobile device according to claim 4, characterised in that the mobile device is provided with a power supply located in the second subpart.
7. Mobile device according to claim 1, 2, 3, 4, 5 or 6, characterised in that the at least one telecommunication coupling is dimensioned for the providing, by the mobile device, of the at least one telecommunication function at a minimum distance between the high-frequency part and the low-frequency part of 50 cm.
8. Mobile device according to claim 1, 2, 3, 4, 5 or 6, characterised in that the at least one further telecommunication coupling is dimensioned for the providing, by the mobile device, of the at least one telecommunication function at a minimum distance between the first subpart and the second subpart of 50 cm.

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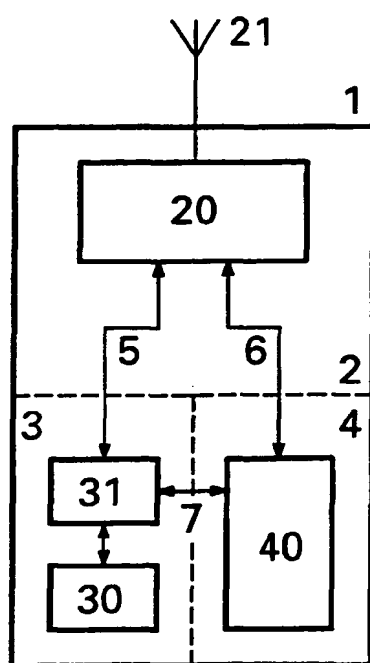


Fig. 1

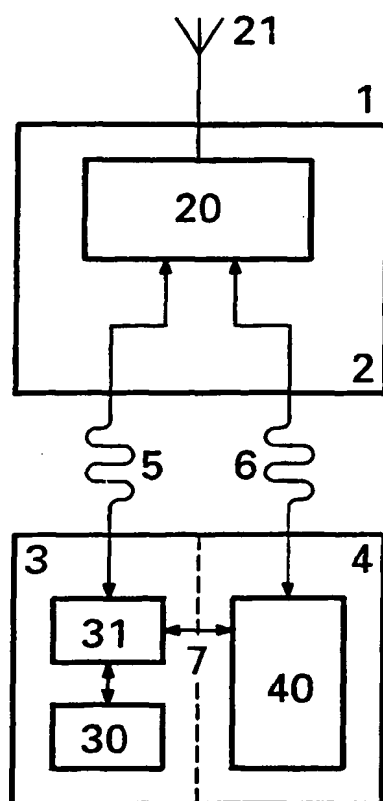


Fig. 2

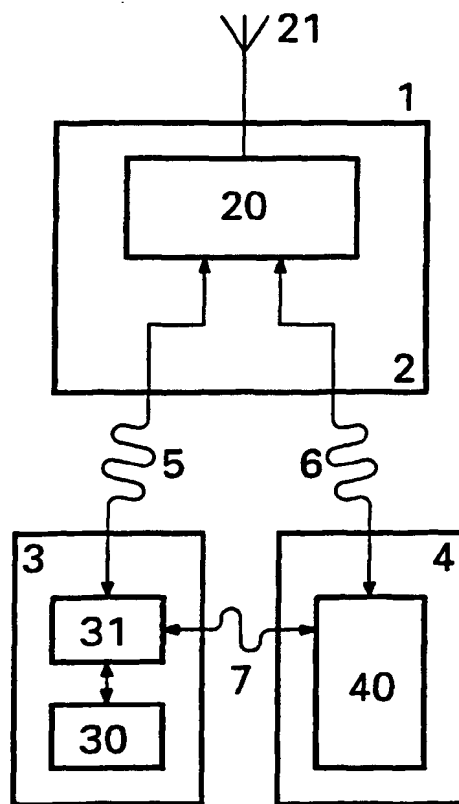


Fig. 3





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# EUROPEAN SEARCH REPORT

Application Number  
EP 96 20 3414

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	FR 2 706 103 A (ERICSSON GE MOBILE COMMUNICAT) 9 December 1994	1,7	H04M1/72 H04B1/38
Y	* page 4, line 17 - page 6, line 6; figures 2,3,6,7 *	2-4	
A	* page 11, line 1 - line 24 *	5,6,8	
Y	---		
Y	EP 0 577 296 A (AMERICAN TELEPHONE & TELEGRAPH) 5 January 1994	2-4	
A	* column 1, line 3 - column 2, line 53; figure 1 *	1,5-8	
A	---		
A	WO 92 08310 A (WEISER TELECOMMUNICATIONS INC) 14 May 1992 * abstract; figures 1-3 *	1-5,7,8	
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			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H04M H04B
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>7 April, 1997</b>	Examiner <b>Andersen, J.G.</b>
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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